BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-01	)	AFFIDAVIT OF Dr. DONALD J. EASTERBROOK REGARDING MOTION TO REOPEN RECORD
SUMAS ENERGY 2, INC.	)	
SUMAS ENERGY 2 GENERATION FACILITY	)	

STATE OF WASHINGTON)
) ss
COUNTY OF WHATCOM)

I, Dr. Donald J. Easterbrook, Ph.D., being first duly sworn, on oath, state as follows:

I am Professor Emeritus of Geology at Western Washington University. I have taught and performed research at the university for the past 40 years. During those years I have studied the geology of Whatcom County. My studies included projects involving earthquake hazards, landslide hazards, and various other environmental issues in the county. In terms of my general background, I have served as national chairman of the Quaternary Geology and Geomorphology Division of the Geological Society of America, chairman of the Geological Society of America national meeting, U.S. representative to a United Nations UNESCO commission, chairman of the geology department at Western Washington University for 12 years, and been a member of a number of national and international committees. I have presented papers in 20 countries and have published about 140 professional papers and eight books. For a more thorough description of my background and qualifications, please see my attached resume.

For the past five years, I and my colleagues, Dr David Engebretson, a seismological expert, who is Professor of Geology at Western Washington University, and Dori Kovanen, who is a Ph.D candidate at the University of British Columbia, have been engaged in an assessment of seismic hazards in Whatcom County, local faults that relate to the seismicity of our local area and to large landslides that occur in the Nooksack Valley, which may have been seismically induced. Using new techniques and technology, our research has uncovered information that was not heretofore known about the seismic activity of the Sumas Valley and the site upon which the proposed SE2 plant is slated to be built. While the existence of the two faults described below have been known for quite some time, the extent of the Vedder Mountain fault across Whatcom County, the association of seismic activity, and the nature of the material in the subsurface (including that underlying Sumas) is new information. This information was not publicly available prior to November 28, 2000.

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To understand how the results of our recent research efforts relate to the proposed site of SE2, it is for the Council to understand that the City of Sumas is situated on a major fault, which we now call the Sumas fault, and is bounded by another fault on the other side of the valley, referred to as the Vedder Mountain fault. The entire Sumas Valley has dropped down at least 1,000 feet in very recent geologic time. The Vedder Mountain fault, the fault across the valley from Sumas, is a major fault, extending from the San Juan Islands into Canada. We have found evidence of seismic activity on this fault, but of more consequence to construction of SE2 is the fact that our research shows that the Sumas fault underlying Sumas is larger and much more seismically active than previously thought. Our research findings are more fully described in the "Summary of the Geology of the Sumas and Vedder Mountain Faults," a copy of which is attached hereto and incorporated by this reference.

The results of our recent research tells us that there are several sources of potential seismic hazards in the area. Depending upon its size, an earthquake on either fault could prove destructive. There are four principal seismic hazards involved.

The first hazard is seismic shaking. Such shaking causes buildings to collapse because the intensity of the shaking exerts forces on the structural members of the buildings. The intensity of the shaking increases with both the size of the earthquake and the proximity of the structure to the source of the quake. The principal hazard to the town of Sumas is that it is essentially on top of one of the two faults (the newly-named Sumas fault). Furthermore, Sumas is close enough to the Vedder Mountain fault, a mile and a half, that it is also an additional hazard for seismic shaking.

The second hazard is ground failure, which means that a building is subject to collapse if the ground under the foundation slides away. A key component of this hazard is the issue of ground failure, as it incorporates a feature called earthquake liquefaction. Liquefaction means that during an earthquake, certain soils, such as silt or clay, will behave as if they are a liquid. Our data suggests that Sumas lies on top of a thick fill of unconsolidated sediments that have a moderate to high potential for liquefaction.

The third seismic hazard, which is considerable in this case, is offset along the fault. Offset is the movement of the land surface on the fault. A good example of the phenomenon is the Seattle fault, which extends from Seattle to Bainbridge Island. We know that Bainbridge Island jumped 20 feet out of the water about 1,000 years ago. Fifteen or twenty feet of land can be offset in a fraction of a second during an earthquake. Offsets pose a serious hazard for Sumas simply because it is situated on a fault. No building could survive a 15 or 20 foot offset through any part of it.

The fourth seismic hazard is from earthquake-generated landslides. It is a secondary effect, but one which can be serious indeed. More than half a dozen large bedrock landslides have been mapped in the Nooksack Valley, the largest of which is about six miles long. Many are two to three miles across and more than two miles long. We are reasonably sure that ancient earthquakes generated these landslides. Such landslides lie in a zone of very intense earthquake

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activity, and nowhere else. The possible hazard arising in the area would stem from the fact that if there was movement during an earthquake from one of the two faults, a landslide from the adjacent Vedder Mountain or Sumas Mountain could be generated.

Given the hazards associated with seismic activity and the findings uncovered by our recent research on the level of seismic activity underlying the Sumas area, it is of paramount importance for the Council to consider the implications of the existence of the faults in making its siting decision in this case. A seismic risk assessment should be performed. Such assessment is necessary to determine what are the risks involved in siting large projects, such as SE2, in such areas, particularly any project which includes hazardous materials on-site. The ultimate issue, which can be resolved by the assessment is whether, given the geology of the site, one can engineer around the identified threat. But having said that, one must realize there are times when engineering alone cannot fully address and remove all geologic risk. Therefore, seismic risk assessments may not simply be viewed as a design issue alone, but a siting issue as well.

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Donald J. Easterbrook

SUBSCRIBED AND SWORN to before me this _____ day of December, 2000.

_____
Notary Public in and for the
State of Washington.
My Commission Expires: _____

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